No. 200700306

THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE

Secretary of Agriculture

An application requesting a certificate of protection for an alleged distinct variety of sexually reproduced, or tuber propagated plant, the name and description of which are contained in the application and exhibits, a copy of which is hereunto annexed and made a part hereof, and the various requirements of LAW in such cases made and provided have been complied with, and the title thereto is, from the records of the PLANT VARIETY PROTECTION OFFICE, in the applicant(s) indicated in the said copy, and Whereas, upon due examination made, the said applicant(s) is (are) adjudged to be entitled to a certificate of plant variety protection under the LAW.

Now, therefore, this certificate of plant variety protection is to grant unto the said applicant(s) and the successors, heirs or assigns of the said applicant(s) for the term of TWENTY years from the date of this grant, subject to the payment of the required fees and periodic replenishment of viable basic seed of the variety in a public repository as provided by LAW, the right to exclude others from selling the variety, or offering it for sale, or reproducing it, or importing it, or exporting it, or conditioning it for propagation, or stocking it for any of the above purposes, or using it in producing a hybrid or different variety therefrom, to the extent provided by the PLANT VARIETY PROTECTION ACT. (84 STAT. 1542, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

CORN, FIELD

'PH4RF'

In Testimony Whereof, *I have hereunto set my hand and caused the seal of the* Plant Variety Protection Office *to be affixed at the* ***City of Washington, D.C.*** *this twenty-ninth day of September, in the year* ***two thousand and ten.***

Attest:

Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Secretary of Agriculture

REPRODUCE LOCALLY. *Include form number and date on all reproductions*

Form Approved - OMB No. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY - PLANT VARIETY PROTECTION OFFICE

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE
(Instructions and information collection burden statement on reverse)

The following statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. 552a) and the Paperwork Reduction Act (PRA) of 1995.

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF OWNER
Pioneer Hi-Bred International, Inc.

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NAME

3. VARIETY NAME
PH4RF

4. ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP Code, and Country)*
7301 NW 62nd Avenue
Johnston, IA 50131-0085

5. TELEPHONE *(include area code)*
515/270-4051

6. FAX *(include area code)*
515/253-2125

FOR OFFICIAL USE ONLY

PVPO NUMBER
#200700306

FILING DATE
May 7, 2007

7. IF THE OWNER NAMED IS NOT A "PERSON", GIVE FORM OF ORGANIZATION *(corporation, partnership, association, etc.)*
Corporation

8. IF INCORPORATED, GIVE STATE OF INCORPORATION
Iowa

9. DATE OF INCORPORATION
March 5, 1999

JMS 12/28/09

10. NAME AND ADDRESS OF OWNER REPRESENTATIVE(S) TO SERVE IN THIS APPLICATION. *(First person listed will receive all papers)*
Steven R. Anderson
Research and Product Development
P.O. Box ~~85~~ 1004
Johnston, IA 50131-~~0085~~ 1004

FEES RECEIVED

FILING AND EXAMINATION FEES:
$ 4382.00
DATE 5/7/07

CERTIFICATION FEE:
$ 768.00
DATE 5/14/10

11. TELEPHONE (Include area code)
515/270-4051

12. FAX (Include area code) 2788
515/253-~~2125~~

13. E-MAIL
steven.anderson@pioneer.com

14. CROP KIND *(Common Name)*
Corn

15. GENUS AND SPECIES NAME OF CROP
Zea Mays

16. FAMILY NAME *(Botanical)*
Gramineae

17. IS THE VARIETY A FIRST GENERATION HYBRID?
☐ YES ☒ NO

18. DOES THE VARIETY CONTAIN ANY TRANSGENES? (***OPTIONAL***)
☐ YES ☒ NO
IF SO, PLEASE GIVE THE ASSIGNED USDA-APHIS REFERENCE NUMBER FOR THE APPROVED PETITION TO DEREGULATE THE GENETICALLY MODIFIED PLANT FOR COMMERICALIZATION. _____

19. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED
(Follow instructions on reverse)
a. ☒ Exhibit A. Origin and Breeding History of the Variety
b. ☒ Exhibit B. Statement of Distinctness
c. ☒ Exhibit C. Objective Description of Variety
d. ☐ Exhibit D. Additional Description of the Variety *(Optional)*
e. ☒ Exhibit E. Statement of the Basis of the Owner's Ownership
f. ☒ Voucher Sample *(3,000 viable untreated seeds or, for tuber propagated varieties, verification that tissue culture will be deposited and maintained in an approved public repository)*
g. ☒ Filing and Examination Fee ($4,382), made payable to "Treasurer of the United States" *(Mail to the Plant Variety Protection Office)*

20. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE SOLD AS A CLASS OF CERTIFIED SEED? *(See Section 83(a) of the Plant Variety Protection Act)*
☐ YES *(If "yes", answer items 21 and 22 below)* ☒ NO *(If "no", go to item 23)*

21. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF CLASSES?
☐ YES ☐ NO
IF YES, WHICH CLASSES? ☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED

22. DOES THE OWNER SPECIFY THAT SEED OF THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS?
☐ YES ☐ NO
IF YES, SPECIFY THE NUMBER 1,2,3, etc. FOR EACH CLASS.
☐ FOUNDATION ☐ REGISTERED ☐ CERTIFIED
(If additional explanation is necessary, please use the space indicated on the reverse.)

23. HAS THE VARIETY (INCLUDING ANY HARVESTED MATERIAL) OR A HYBRID PRODUCED FROM THIS VARIETY BEEN SOLD, DISPOSED OF, TRANSFERRED, OR USED IN THE U. S. OR OTHER COUNTRIES?
☒ YES ☐ NO
IF YES, YOU MUST PROVIDE THE DATE OF FIRST SALE, DISPOSITION, TRANSFER, OR USE FOR EACH COUNTRY AND THE CIRCUMSTANCES. *(Please use space indicated on reverse.)*

24. IS THE VARIETY OR ANY COMPONENT OF THE VARIETY PROTECTED BY INTELLECTUAL PROPERTY RIGHT *(PLANT BREEDER'S RIGHT OR PATENT)*?
☒ YES ☒ NO
IF YES, PLEASE GIVE COUNTRY, DATE OF FILING OR ISSUANCE AND ASSIGNED REFERENCE NUMBER. *(Please use space indicated on reverse.)*

JMS 5/13/10

25. The owners declare that a viable sample of basic seed of the variety has been furnished with application and will be replenished upon request in accordance with such regulations as may be applicable, or for a tuber propagated variety a tissue culture will be deposited in a public repository and maintained for the duration of the certificate.

The undersigned owner(s) is(are) the owner of this sexually reproduced or tuber propagated plant variety, and believe(s) that the variety is new, distinct, uniform, and stable as required in Section 42, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act.

Owner(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.

SIGNATURE OF OWNER		SIGNATURE OF OWNER	
		Steven R Anderson	
NAME *(Please print or type)*		NAME *(Please print or type)*	
		Steven R. Anderson	
CAPACITY OR TITLE	DATE	CAPACITY OR TITLE	DATE
		Research Scientist	5-4-2007

(See reverse for instructions and information collection burden statement)

ST-470 (02-06) designed by the Plant Variety Protection Office using Word 2003.

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GENERAL INSTRUCTIONS: To be effectively filed with the Plant Variety Protection Office (PVPO), **ALL** of the following items must be **received** in the PVPO: (1) Completed application form signed by the owner; (2) completed exhibits A, B, C, E, F; (3) for a tuber reproduced variety, verification that a viable (*in the sense that it will reproduce an entire plant*) tissue culture will be deposited and maintained in an approved public repository; and (4) payment by credit card or check drawn on a U.S. bank for $4,382 ($518 filing fee and $3,864 examination fee), payable to "Treasurer of the United States" *(See Section 97.6 of the Regulations and Rules of Practice.)* **NEW:** With the application for a seed reproduced variety **or by direct deposit soon after filing,** the applicant must provide at least 3,000 viable untreated seeds of the variety *per se,* and for a hybrid variety at least 3,000 untreated seeds of each line necessary to **reproduce** the variety. Partial applications will be held in the PVPO for not more than 90 days; then returned to the applicant as un-filed. Mail application and other requirements to Plant Variety Protection Office, AMS, USDA, Room 401, NAL Building, 10301 Baltimore Avenue, Beltsville, MD 20705-2351. Retain one copy for your files. All items on the face of the application are self explanatory unless noted below. Corrections on the application form and exhibits must be initialed and dated. **DO NOT** use masking materials to make corrections. If a certificate is allowed, you will be requested to send a payment by credit card or check payable to "Treasurer of the United States" in the amount of $768 for issuance of the certificate. Certificates will be issued to owner, not licensee or agent.

NOTES: It is the responsibility of the applicant/owner to keep the PVPO informed of any changes of address or change of ownership or assignment or owner's representative during the life of the application/certificate. The fees for filing a change of address; owner's representative; ownership or assignment; or any modification of owner's name is specified in Section 97.175 of the regulations. (See Section 101 of the Act, and Sections 97.130.97.131, 97.175(h) of the Regulations and Rules of Practice.)

Plant Variety Protection Office
Telephone: (301) 504-5518 **FAX: (301) 504-5291**
General E-mail: PVPOmail@usda.gov
Homepage: http://www.ams.usda.gov/science/pvpo/PVPindex.htm

SPECIFIC INSTRUCTIONS:
To avoid conflict with other variety names in use, the applicant must check the appropriate recognized authority and **provide evidence** that the permanent name of the application variety (even if it is a parental, inbred line) has been cleared by the appropriate recognized authority before the Certificate of Protection is issued. For example, for agricultural and vegetable crops, contact: U.S. Department of Agriculture, Agricultural Marketing Service, Livestock and Seed Programs, **Seed Regulatory and Testing Branch,** 801 Summit Crossing Place, Suite C, Gastonia, North Carolina 28054-2193 Telephone: (704) 810-8870. http://www.ams.usda.gov/lsg/seed.htm.

ITEM

19a. Give:
(1) the genealogy, including public and commercial varieties, lines, or clones used, and the breeding method;
(2) the details of subsequent stages of selection and multiplication;
(3) evidence of uniformity and stability; and
(4) the type and frequency of variants during reproduction and multiplication and state how these variants may be identified

19b. Give a summary of the variety's distinctness. Clearly state how this application variety may be distinguished from all other varieties in the same crop. If the new variety is most similar to one variety or a group of related varieties:

(1) identify these varieties and state all differences objectively;
(2) attach replicated statistical data for characters expressed numerically and demonstrate that these are clear differences; and
(3) submit, if helpful, seed and plant specimens or photographs (prints) of seed and plant comparisons which clearly indicate distinctness.

19c. Exhibit C forms are available from the PVPO Office for most crops; specify crop kind. Fill in Exhibit C (Objective Description of Variety) form as completely as possible to describe your variety.

19d. Optional additional characteristics and/or photographs. Describe any additional characteristics that cannot be accurately conveyed in Exhibit C. Use comparative varieties as is necessary to reveal more accurately the characteristics that are difficult to describe, such as plant habit, plant color, disease resistance, *etc.*

19e. Section 52(5) of the Act requires applicants to furnish a statement of the basis of the applicant's ownership. An Exhibit E form is available from the PVPO.

20. If "Yes" is specified *(seed of this variety be sold by variety name only, as a class of certified seed)*, the applicant **MAY NOT** reverse this affirmative decision after the variety has been sold and so labeled, the decision published, or the certificate issued. However, if "No" has been specified, the applicant may change the choice. *(See Regulations and Rules of Practice, Section 97.103).*

23. *See Sections 41, 42, and 43 of the Act and Section 97.5 of the regulations for eligibility requirements.*

24. *See Section 55 of the Act for instructions on claiming the benefit of an earlier filing date.*

22. CONTINUED FROM FRONT *(Please provide a statement as to the limitation and sequence of generations that may be certified.)*

23. CONTINUED FROM FRONT *(Please provide the date of first sale, disposition, transfer, or use for each country and the circumstances, if the variety (including any harvested material) or a hybrid produced from this variety has been sold, disposed of, transferred, or used in the U.S. or other countries.)*

November 1, 2006 (Canada, United States)

24. CONTINUED FROM FRONT *(Please give the country, date of filing or issuance, and assigned reference number, if the variety or any component of the variety is protected by intellectual property right (Plant Breeder's Right or Patent).)*
USPTO 1/31/2007 Application No. 11/669,325 Patent No. 7569754

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Exhibit A. Origin and Breeding History for PH4RF

Pedigree: PH6WA/PH5WB)XA611111X

Pioneer Line PH4RF, *Zea mays L.*, a yellow endosperm corn inbred, was developed by Pioneer Hi-Bred International, Inc. from the single cross hybrid PH6WA (PVP Certificate Number 200200179)X PH5WB (PVP Certificate No. 200100254) using the pedigree method of plant breeding. Varieties PH5WB and PH6WB are proprietary inbred lines of Pioneer Hi-Bred International, Inc. Selfing was practiced from the above hybrid for 8 generations using pedigree selection. During line development, crosses were made to inbred testers for the purpose of estimating the line's combining ability. Yield trials were grown at Windfall, Indiana as well as other Pioneer research locations. After initial testing, additional hybrid combinations have been evaluated and subsequent generations of the line have been grown and hand-pollinated with observations again made for uniformity.

Variety PH4RF has shown uniformity and stability for all traits as described in Exhibit C - "Objective Description of Variety". It has been self-pollinated and ear-rowed 7 generations with careful attention paid to selection criteria and uniformity of plant type to assure genetic homozygosity and phenotypic stability. The line has been increased both by hand and in isolated fields with continued observations for uniformity and stability, and for 4 generations during the final stages of inbred development and seed multiplication. Very high standards for genetic purity have been established morphologically using field observations and using sound lab molecular marker methodology.

No variant traits have been observed or are expected in PH4RF.

The criteria used in the selection of PH4RF were yield, both per se and in hybrid combinations. Late season plant health, grain quality, and stalk lodging resistance, were important criteria considered during selection. Other selection criteria include: ability to germinate in adverse conditions, disease and insect resistance, pollen yield and tassel size.

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Exhibit A: Developmental History for PH4RF

Pedigree Grown Season/Year	Inbreeding Level of Pedigree Grown
PH6WA	F0
PH5WB	F0
PH6WA/PH5WB 1998	F1
PH6WA/PH5WB)X 1999	F2
PH6WA/PH5WB)XA6 2000	F3
PH6WA/PH5WB)XA61 2001	F4
PH6WA/PH5WB)XA611 2001	F5
PH6WA/PH5WB)XA6111 2002	F6
PH6WA/PH5WB)XA61111 2002	F7
PH6WA/PH5WB)XA611111 2003	F8
PH6WA/PH5WB)XA611111X	F9 (SEED)

*PH4RF was selfed and ear-rowed from F2 through F8 generation.
#Uniformity and stability were established from F3 through F9 generation and beyond when seed supplies were increased.

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Exhibit B: Novelty Statement

Variety PH4RF mostly resembles Pioneer Hi-Bred International, Inc. proprietary inbred line PH5WB (PVP Certificate No. 200100254). Table 1 shows two sample t-tests on data collected primarily in Johnston and Dallas Center, Iowa in 2005 and 2006. The traits collectively show measurable differences between the two varieties.

Exhibit B: Novelty Statement

Variety PH4RF has a shorter ear length (16.2 cm vs 18.7 cm) than variety PH5WB (Table 1).

Variety PH4RF has a shorter tassel length (50.6 cm vs 56.7 cm) than variety PH5WB (Table 1).

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Exhibit B: Novelty Statement Table(s)

Table 1: Data from Johnston and Dallas Center, Iowa in 2005 and 2006 presented by trait, across years, and broken out by year. Data are supporting evidence for differences between PH4RF and PH5WB. Varieties were grown at 2 locations in 2005 and 3 locations in 2006 where each location had different environmental conditions. Environments had different planting dates and were in different fields. A two-sample t-test was used to compare differences between means.

Ear length (cm)

Level	Station	Year	Variety-1	Variety-2	Cnt-1	Cnt-2	Mean-1	Mean-2	Mean_Diff	StDev-1	StDev-2	StErr-1	StErr-2	DF	t-Value	Prob_Pool
Over All			PH4RF	PH5WB	25	25	16.2	18.7	-2.6	1.028	1.173	0.206	0.235	48	-8.2	0.000
Year		2005	PH4RF	PH5WB	10	10	16.2	18.9	-2.7	0.789	1.197	0.249	0.379	18	-6.0	0.000
Year		2006	PH4RF	PH5WB	15	15	16.1	18.6	-2.5	1.187	1.183	0.307	0.306	28	-5.7	0.000

Tassel length (cm)

Level	Station	Year	Variety-1	Variety-2	Cnt-1	Cnt-2	Mean-1	Mean-2	Mean_Diff	StDev-1	StDev-2	StErr-1	StErr-2	DF	t-Value	Prob_Pool
Over All			PH4RF	PH5WB	25	25	50.6	56.7	-6.1	4.073	4.039	0.815	0.808	48	-5.3	0.000
Year		2005	PH4RF	PH5WB	10	10	53.2	58.8	-5.6	3.011	2.741	0.952	0.867	18	-4.3	0.000
Year		2006	PH4RF	PH5WB	15	15	48.8	55.3	-6.5	3.783	4.217	0.977	1.089	28	-4.4	0.000

EXHIBIT C
(Corn; Maize)
(8-22-2001)

United States Department of Agriculture, Agricultural Marketing Service
Science and Technology, Plant Variety Protection Office
National Agricultural Library Building, Room 400
Beltsville, MD 20705-2351

OBJECTIVE DESCRIPTION OF VARIETY
CORN (Zea mays L.)

Name of Applicant(s)	Variety Seed Source	Variety Name or Temporary Designation
Pioneer Hi-Bred International, Inc		PH4RF

Address (Street & No., or R.F.D. No., City, State, Zip Code and Country	**FOR OFFICIAL USE**	PVPO Number
7301 **NW 62nd Avenue, P.O. Box 85, Johnston, Iowa 50131-0085**		**#200700306**

Place the appropriate number that describes the varietal characters typical of this inbred variety in the spaces below. Right justify whole numbers by adding leading zeroes if necessary. Completeness should be striven for to establish an adequate variety description. Traits designated by a "*" are considered necessary for an adequate variety description and must be completed.

COLOR CHOICES (Use in conjunction with Munsell color code to describe all color choices; describe #25 and #26 in Comments section):

01. Light Green	06. Pale Yellow	11. Pink	16. Pale Purple	21. Buff	26. Other (Describe)
02. Medium Green	07. Yellow	12. Light Red	17. Purple	22. Tan	
03. Dark Green	08. Yellow-Orange	13. Cherry Red	18. Colorless	23. Brown	
04. Very Dark Green	09. Salmon	14. Red	19. White	24. Bronze	
05. Green-Yellow	10. Pink-Orange	15. Red & White	20. White Capped	25. Variegated (Describe)	

STANDARD INBRED CHOICES [Use the most similar (in background and maturity) of these to make comparisons based on grow-out trial data]:

Yellow Dent Families:

Family	Members
B14	CM105, A632, B64, B68
B37	B37, B76, H84
B73	N192, A679, B73, Nc268
C103	Mo17, Va102, Va35, A682
Oh43	A619, MS71, H99, Va26
WF9	W64A, A554, A654, Pa91

Yellow Dent (Unrelated):
Co109, ND246
Oh7, T232
W117, W153R
W182BN

White Dent:
CI66, H105, Ky228

Sweet Corn:
C13, Iowa5125, P39, 2132

Popcorn:
SG1533, 4722, HP301, HP7211

Pipecorn:
Mo15W, Mo16W, Mo24W

1. TYPE: (describe intermediate types in "Comments" section)	Standard Inbred Name	B73
2 (1=Sweet, 2=Dent, 3=Flint, 4=Flour, 5=Pop, 6=Ornamental, 7=Pipecorn)	3 Type	

2. REGION WHERE DEVELOPED IN THE U.S.A.:	Standard Seed Source	PI 550473
3 (1=N.West, 2=N.Central, 3=N.East, 4=S.East, 5=S.Central, 6=S.West, 7=Other	_ Region	

3. MATURITY (In Region Best Adaptability; show Heat Unit formula in "Comments" section):

DAYS	HEAT UNITS		DAYS	HEAT UNITS
59	1,352.0	From emergence to 50% of plants in silk	62	1,436.4
59	1,340.6	From emergence to 50% of plants in pollen	61	1,397.4
2	48	From 10% to 90% pollen shed	2	59
---	----._	From 50% silk to optimum edible quality	---	----._
---	----._	From 50% silk to harvest at 25% moisture	---	----._

4. PLANT:	St.Dev.	Sample Size	Mean	St.Dev.	Sample Size
223.8 cm Plant Height (to tassel tip)	21.25	25	241.4	9.35	25
80.5 cm Ear Height (to base of top ear node)	11.34	25	103.0	10.28	25
15.3 cm Length of Top Ear Internode	1.57	25	16.6	1.71	25
0.0 Average Number of Tillers	0.02	5	0.0	0.00	5
0.9 Average Number of Ears per Stalk	0.14	5	1.1	0.07	5
1 Anthocyanin of Brace Roots: 1=Absent, 2=Faint, 3=Moderate, 4=Dark			3		

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5. LEAF	St.Dev.	Sample Size	Mean	St.Dev.	Sample Size
8.9 cm Width of Ear Node Leaf	0.81	25	9.0	0.68	25
75.7 cm Length of Ear Node Leaf	4.62	25	86.9	3.91	25
6.7 Number of leaves above top ear	0.95	25	6.2	0.76	25
26.1 Degrees Leaf Angle	4.16	25	27.4	4.60	25
(Measure from 2nd leaf above ear at anthesis to stalk above leaf)					
4 Leaf Color (Munsell Code) 7.5GY36			4 (Munsell Code) 7.5GY34		
6 Leaf Sheath Pubescence (Rate on scale from 1=none to 9=like peach fuzz)			4		
__ Marginal Waves (Rate on scale from 1=none to 9=many)			__		
__ Longitudinal Creases (Rate on scale from 1=none to 9=many)			__		

6. TASSEL:	St.Dev.	Sample Size	Mean	St.Dev.	Sample Size
1.3 Number of Primary Lateral Branches	0.99	25	7.5	1.53	25
27.0 Degrees Branch Angle from Central Spike	6.25	18	22.2	8.51	18
50.6 cm tassel Length	4.07	25	56.2	3.25	25
(from top leaf collar to tassel tip)					
3 Pollen Shed (Rate on scale from 0=male sterile to 9=heavy shed)			5		
6 Anther Color (Munsell Code) 5Y86			7 (Munsell Code) 5Y8.54		
2 Glume Color (Munsell Code) 7.5GY56			2 (Munsell Code) 5GY56		
1 Bar Glumes (Glume Bands): 1=Absent, 2=Present			1		

7a. EAR (Unhusked Data):					
1 Silk Color (3 days after emergence) (Munsell Code) 2.5GY88			1 Munsell Code 2.5GY94		
2 Fresh Husk Color (25 days after 50% silking) (Munsell Code) 5GY68			2 Munsell Code 5GY78		
21 Dry Husk Color (65 days after 50% silking) (Munsell Code) 2.5Y84			21 Munsell Code 2.5Y8.54		
3 Position of Ear at Dry Husk Stage: 1=Upright, 2=Horizontal, 3=Pendent			2		
4 Husk Tightness (Rate on scale from 1=very loose to 9=very tight			7		
2 Husk Extension (at harvest): 1=Short(ears exposed), 2=Medium (<8cm), 3=Long (8-10cm beyond ear tip), 4=Very Long (>10cm)			3		

7b. EAR (Husked Ear Data)	St. Dev.	Sample Size	Mean	St.Dev.	Sample Size
16.2 cm Ear Length	1.03	25	14.1	0.64	25
41.0 mm Ear Diameter at mid-point	2.01	25	46.3	1.97	25
128.9 gm Ear Weight	20.98	25	131.4	19.59	25
16.5 Number of Kernel Rows	1.05	25	18.0	1.41	25
2 Kernel Rows: 1=Indistinct, 2=Distinct			2		
1 Row Alignment: 1=Straight, 2=Slightly Curved, 3=Spiral			2		
8.2 cm Shank Length	1.61	25	10.3	2.19	25
2 Ear Taper: 1=Slight cyl., 2=Average slightly con., 3=Extreme conical			2		

8. KERNEL (Dried):	St.Dev.	Sample Size	Mean	St.Dev.	Sample Size
11.1 mm Kernel Length	0.83	25	11.2	0.76	25
7.7 mm Kernel Width	0.61	25	7.3	0.56	25
4.8 mm Kernel Thickness	0.69	25	4.4	0.71	25
39.6 % Round Kernels (Shape Grade)	8.81	5	30.8	6.51	5
1 Aleurone Color Pattern: 1=Homozygous, 2=Segregating (describe) _____			1 (describe) _____		
7 Aleurone Color (Munsell Code) 10YR714			7 Munsell Code 2.5Y812		
7 Hard Endosperm Color (Munsell Code) 10YR612			7 Munsell Code 10YR712		
3 Endosperm Type: 1=Sweet(su1), 2=Extra Sweet(sh2), 3=Normal Starch, 4=High Amylose Starch, 5=Waxy Starch, 6=High Protein, 7=High Lysine, 8=Super Sweet (se), 9=High Oil, 10=Other_____			3 (describe) _____		
27.0 gm Weight per 100 kernels (unsized sample)	5.10	5	27.0	2.35	5

9. COB:	St.Dev.	Sample Size	Mean	St.Dev	Sample Size
20.8 mm Cob Diameter at mid-point	0.83	25	27.6	0.95	25
19 Cob Color (Munsell Code) 5Y91			11 Munsell Code 10R66		

Note: Use chart on first page to choose color codes for color traits

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10. DISEASE RESISTANCE (Rate from 1(most susceptible) to 9 (most resistant); leave blank if not tested; leave Race or Strain Options blank if polygenic):	
A. Leaf Blights, Wilts, and Local Infection Diseases	
_ Anthracnose Leaf Blight (Colletotrichum graminicola)	_ Anthracnose Leaf Blight
5 Common Rust (Puccinia sorghi)	Common Rust
9 Common Smut (Ustilago maydis)	_ Common Smut
Eyespot (Kabatiella zeae)	Eyespot
5 Goss's Wilt (Clavibacter michiganense spp. nebraskensis)	Goss's Wilt
4 Gray Leaf Spot (Cercospora zeae-maydis)	3 Gray Leaf Spot
_ Helminthosporium Leaf Spot (Bipolaris zeicola) Race_____	_ Helminthosporium Leaf Spot Race___
5 Northern Leaf Blight (Exserohilum turcicum) Race_____	3 Northern Leaf Blight Race___
Southern Leaf Blight (Bipolaris maydis) Race_____	Southern Leaf Blight Race___
Southern Rust (Puccinia Polysora)	Southern Rust
3 Stewart's Wilt (Erwinia stewartii)	4 Stewart's Wilt
_ Other (Specify)_____	_ Other (Specify)_____
B. Systemic Diseases	
Corn Lethal Necrosis (MCMV and MDMV)	Corn Lethal Necrosis
9 Head Smut (Sphacelotheca reiliana)	9 Head Smut
_ Maize Chlorotic Dwarf Virus (MCDV)	_ Maize Chlorotic Dwarf Virus
_ Maize Chlorotic Mottle Virus (MCMV)	_ Maize Chlorotic Mottle Virus
Maize Dwarf Mosaic Virus (MDMV) Strain_____	Maize Dwarf Mosaic Virus Strain___
_ Sorghum Downy Mildew of Corn (Peronosclerospora sorghi)	_ Sorghum Downy Mildew of Corn
_ Other (Specify)_____	_ Other (Specify)_____
C. Stalk Rots	
5 Anthracnose Stalk Rot (Colletotrichum graminicola)	Anthracnose Stalk Rot
Diplodia Stalk Rot (Stenocarpella maydis)	_ Diplodia Stalk Rot
Fusarium Stalk Rot (Fusarium moniliforme)	_ Fusarium Stalk Rot
4 Gibberella Stalk Rot (Gibberella zeae)	_ Gibberella Stalk Rot
_ Other (Specify)_____	_ Other (Specify)_____
D. Ear and Kernel Rots	
_ Aspergillus Ear and Kernel Rot (Aspergillus flavus)	_ Aspergillus Ear & Kernel Rot
4 Diplodia Ear Rot (Stenocarpella maydis)	2 Diplodia Ear Rot
7 Fusarium Ear and Kernel Rot (Fusarium moniliforme)	7 Fusarium Ear & Kernel Rot
Gibberella Ear Rot (Gibberella zeae)	Gibberella Ear Rot
_ Other (Specify)_____	Other (Specify)_____

Note: Use chart on first page to choose color codes for color traits.

11. INSECT RESISTANCE (Rate from 1(most susceptible) to 9 (most resistant); Leave blank if not tested	St. Dev.	Sample Size		St. Dev.	Sample Size
_ Banks Grass Mite (Oligonychus pratensis)			_ Banks Grass Mite		
Corn Earworm (Helicoverpa zea)			Corn Earworm		
_ Leaf Feeding			_ Leaf Feeding		
Silk Feeding ___._mg larval wt.	____	____	___._	____	____
_ Ear Damage			_ Ear Damage		
_ Corn Leaf Aphid (Rhopalosiphum maidis)			_ Corn Leaf Aphid		
___ Corn Sap Beetle (Carpophilus dimidiatus)			_ Corn Sap Beetle		
European Corn Borer (Ostrinia nubilalis)			European Corn Borer		
1 st Generation (Typically Whorl Leaf Feeding)			1 st Generation		
_ 2 nd Generarion (Typically Leaf Sheath-Collar Feeding)			_ 2 nd Generation		
Stalk Tunneling: ___._cm tunneled/plant	____	____	___._	____	____
Fall Armyworm (Spodoptera frugiperda)			Fall Armyworm		
_ Leaf-Feeding			_ Leaf-Feeding		
Silk-Feeding ___._mg larval wt.	____	____	___._	____	____
_ Maize Weevil (Sitophilus zeamais)			_ Maize Weevil		
_ Northern Rootworm (Diabrotica barberi)			_ Northern Rootworm		
_ Southern Rootworm (Diabrotica undecimpunctata)			_ Southern Rootworm		
Southwestern Corn Borer (Diatraea grandiosella)			Southwestern Corn Borer		
_ Leaf Feeding			_ Leaf Feeding		
Stalk Tunneling: ___._cm tunneled/plant	____	____	___._	____	____
_ Two-spotted Spider Mite (Tetranychus urticae)			_ Two-spotted Spider Mite		
_ Western Rootworm (Diabrotica virgifera virgifera)			_ Western Rootworm		
_ Other (Specify)_____			_ Other (Specify)_____		

12. AGRONOMIC TRAITS:	
4 Stay Green (at 65 days after anthesis) (Rate on scale from 1=worst to 9=excellent)	2 Stay Green
% Dropped Ears (at 65 days after anthesis)	% Dropped ears
_ % Pre-anthesis Brittle Snapping	_ % Pre-anthesis Brittle Snapping
13 % Pre-anthesis Root Lodging	% Pre-anthesis Root Lodging
% Post-anthesis Root Lodging (at 65 days after anthesis)	Post-anthesis Root Lodging
6,665.0 Kg/ha Yield of Inbred Per Se (at 12-13% grain moisture)	5,526.0 Yield

13. MOLECULAR MARKERS: (0=data unavailable; 1=data available but not supplied; 2=data supplied.)

1 Isozymes _ RFLP's _ RAPD's _ Other (Specify)_____

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COMMENTS (e. g. state how heat units were calculated, standard inbred seed source, and/or where data was collected. Continue in Exhibit D)

Insect, disease, brittle snapping and root lodging data are collected mainly from environment where variability for the trait can be obtained within the experiment.

CLARIFICATION OF DATA IN EXHIBITS B AND C

Please note the data presented in Exhibit B and C, "Objective Description of Variety," are collected primarily at Johnston and Dallas Center, Iowa. The data in Table 1 are from two sample t-tests using data collected in Johnston and Dallas Center, IA. These traits in exhibit B collectively show distinct differences between the two varieties.

Our experimental design was set up in a typical complete block design commonly used in agricultural corn research experiments with one replication grown at each location. The experiment procedures generally involve three locations/environments with different planting dates, planted in 17.42 ft. rows with 2 rows for each variety. Approximately 24-30 plants emerged in each of 2 rows for a total of around 48 to 60 plants being evaluated at each location and 144 to 180 plants across locations. For plant level traits, we sampled 5 representative plants from the 2 rows of the 2 row plot (group) of plants at each location. For plot level traits we evaluated the 2 row plot (group) and gave a representative score or average on the 48-60 plants in the group within an experiment. One of the 3 locations was dropped in 2005 due to poor emergence and field conditions.

Month	GROWING DEGREE UNITS (GDU's)				PRECIPITATION (Inches)			
	2005		2006		2005		2006	
	D. Center	Johnston	D. Center	Johnston	D. Center	Johnston	D. Center	Johnston
May	356	388	390	460	5.04	6.63	1.23	1.22
June	677	729	643	667	1.52	6.85	0.37	1.08
July	711	788	779	816	2.84	5.02	5.19	5.39
August	626	725	671	754	2.31	1.98	5.85	4.7
September	526	585	361	417	2.01	2.81	4.59	3.98
TOTAL	**2896**	**3215**	**2844**	**3114**	**13.72**	**23.29**	**17.23**	**16.37**

YEAR	PLANTING DATES		
	DC	JH-1	JH-2
2005	6-May	3-May	10-May
2006	12-May	4-May	10-May

Calculate GDU's

Growing Degree Units use the following formula: GDU = ((T1+T2)/2)-50

- Where T1 = minimum temperature for a given day with 50 degrees Fahrenheit as the minimum temperature used and 86 degrees Fahrenheit is the maximum temperature used.
- Where T2 = maximum temperature for a given day with 86 degrees Fahrenheit as the maximum temperature used and 50 degrees Fahrenheit is the minimum temperature used.

GDU"s are calculated each day and accumulated (summed) over certain number of days.

NOTE: In general, cases where less than 10 observations are presented the trait was collected at the plot level as it has been done in the past. This means many more plants were visually evaluated according to the procedure outlined above, and then a score of the "population" of the plants was recorded for each location. We have adjusted our current process to sample at least 15 plants for plant-level traits at a location.

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REPRODUCE LOCALLY. Include form number and edition date on all reproductions. FORM APPROVED - OMB NO. 0581-0055

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

EXHIBIT E
STATEMENT OF THE BASIS OF OWNERSHIP

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). The information is held confidential until the certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S)

PIONEER HI-BRED INTERNATIONAL, INC.

2. TEMPORARY DESIGNATION OR EXPERIMENTAL NUMBER

3. VARIETY NAME

PH4RF

4 ADDRESS *(Street and No., or R.F.D. No., City, State, and ZIP, and Country)*

7301 NW 62nd AVENUE
P.O.BOX 85
JOHNSTON, IA 50131-0085

5. TELEPHONE *(include area code)*

515-270-4051

6. FAX *(include area code)*

515-253-2125

7. PVPO NUMBER

#200700306

8. Does the applicant own all rights to the variety? *Mark an "X" in the appropriate block.* **If no, please explain:** ☒ YES ☐ NO

9. Is the applicant (individual or company) a U.S. national or a U.S. based company? **If no, give name of country.** ☒ YES ☐ NO

10. Is the applicant the original owner? ☒ YES ☐ NO **If no, please answer one of the following:**

a. If the original rights to variety were owned by individual(s), is (are) the original owner(s) a U.S. National(s)?

☐ YES ☐ NO **If no, give name of country**

b. If the original rights to variety were owned by a company(ies), is (are) the original owner(s) a U.S. based company?

☒ YES ☐ NO **If no, give name of country**

11. Additional explanation on ownership (Trace ownership from original breeder to current owner. Use the reverse for extra space if needed):

Pioneer Hi-Bred International, Inc. (PHI), Des Moines, Iowa, and/or its wholly owned subsidiary Pioneer Overseas Corporation (POC), Des Moines, Iowa, is the employer of the plant breeders involved in the selection and development of PH4RF. Pioneer Hi-Bred International and/or Pioneer Overseas Corporation has the sole rights and ownership of PH4RF pursuant to written contracts that assign all rights in the variety to PHI and/or POC at the time such variety was created. No rights to this variety are retained by any individuals.

PLEASE NOTE:

Plant variety protection can only be afforded to the owners (not licensees) who meet the following criteria:

1. If the rights to the variety are owned by the original breeder, that person must be a U.S. national, national of a UPOV member country, or national of a country which affords similar protection to nationals of the U.S. for the same genus and species.

2. If the rights to the variety are owned by the company which employed the original breeder(s), the company must be U.S. based, owned by nationals of a UPOV member country, or owned by nationals of a country which affords similar protection to nationals of the U.S. for the same genus and species.

3. If the applicant is an owner who is not the original owner, both the original owner and the applicant must meet one of the above criteria.

The original breeder/owner may be the individual or company who directed the final breeding. See Section 41(a)(2) of the Plant Variety Protection Act for definitions.

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U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
SCIENCE AND TECHNOLOGY
PLANT VARIETY PROTECTION OFFICE
BELTSVILLE, MD 20705

EXHIBIT F
DECLARATION REGARDING DEPOSIT

NAME OF OWNER (S)	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country)	TEMPORARY OR EXPERIMENTAL DESIGNATION
Pioneer Hi-Bred International, Inc.	7301 NW 62nd Avenue Johnston, IA 50131-0085	VARIETY NAME PH4RF
NAME OF OWNER REPRESENTATIVE (S)	ADDRESS (Street and No. or RD No., City, State, and Zip Code and Country)	FOR OFFICIAL USE ONLY
Steven R. Anderson	7301 NW 62nd Avenue Johnston, IA 50131-0085	PVPO NUMBER #200700306

I do hereby declare that during the life of the certificate a viable sample of propagating material of the subject variety will be deposited, and replenished as needed periodically, in a public repository in the United States in accordance with the regulations established by the Plant Variety Protection Office.

Steven R Anderson
Signature

5-4-2007
Date